

April 18, 2003

Sarah Loftus McLallen  
Manager, CHEMSTAR  
The American Chemistry Council Petroleum Additives  
Panel Health, Environmental and Regulatory Task Group  
1300 Wilson Boulevard  
Arlington, VA 22209

Dear Ms. McLallen:

The Office of Pollution Prevention and Toxics is transmitting EPA's comments on the robust summaries and test plans for Polybutylene Succinic Anhydrides and Alkenyl Succinic Anhydride posted on the ChemRTK HPV Challenge Program Web site on December 20, 2002. I commend The American Chemistry Council's Petroleum Additives Panel Health, Environmental and Regulatory Task Group for their commitment to the HPV Challenge Program.

EPA reviews test plans and robust summaries to determine whether the reported data and test plans will provide the data necessary to adequately characterize each SIDS endpoint. On its Challenge Web site, EPA has provided guidance for determining the adequacy of data and preparing test plans used to prioritize chemicals for further work.

EPA will post this letter and the enclosed comments on the HPV Challenge Web site within the next few days. As noted in the comments, we ask that The American Chemistry Council's Petroleum Additives Panel Health, Environmental and Regulatory Task Group advise the Agency, within 90 days of this posting on the Web site, of any modifications to its submission.

If you have any questions about this response, please contact Richard Hefter, Chief of the HPV Chemicals Branch, at 202-564-7649. Submit questions about the HPV Challenge Program through the "Contact Us" link on the HPV Challenge Program Web site pages or through the TSCA Assistance Information Service (TSCA Hotline) at (202) 554-1404. The TSCA Hotline can also be reached by e-mail at [tsca-hotline@epa.gov](mailto:tsca-hotline@epa.gov).

I thank you for your submission and look forward to your continued participation in the HPV Challenge Program.

Sincerely,

-S-

Oscar Hernandez, Director  
Risk Assessment Division

Enclosure

cc: C. Auer  
A. Abramson  
W. Penberthy  
M. E. Weber

**EPA Comments on Chemical RTK HPV Challenge Submissions:  
Alkenyl Succinic Anhydride and Polybutylene Succinic Anhydrides Categories**

**Summary of EPA Comments**

The sponsor, The American Chemistry Council Petroleum Additives Panel Health, Environmental, and Regulatory Task Group, submitted test plans and robust summaries to EPA for two categories: (1) Alkenyl succinic anhydride (three chemicals) and (2) Polybutylene succinic anhydrides (two chemicals) dated November 22 and November 26, 2002, respectively. EPA posted the submissions on the ChemRTK HPV Challenge Web site on December 20.

EPA believes that the categories and test plans as proposed are not adequately supported. The submitter needs to provide a better basis for using test data from one category to support the other and for the hydrolysis argument that links the two categories.

EPA's preliminary comments appear below. EPA requests that the submitter advise the Agency within 90 days of any modifications to the submissions.

**EPA Comments on the Alkenyl Succinic Anhydride and Polybutylene Succinic Anhydrides  
Challenge Submissions**

**General**

The submitter needs to address the hydrolysis of these chemicals which is the principal issue linking these submissions and the proposed testing strategy. Given this possible unifying feature, the submitter should consider addressing the chemicals in one category submission.

Robust summaries were not provided for the estimated values given for the physicochemical endpoints. The submitted robust summaries generally appear complete, but all are missing test substance purity. EPA did not evaluate them for data adequacy.

**Category Definition**

**(1) Alkenyl succinic anhydride**

The category covers three substances, two containing monoalkyl succinic anhydrides with differing monounsaturated alkyl groups but same molecular weights, and a third containing a monoalkyl butanedioic acid. The alkyl portion of one of the succinic anhydrides is a highly branched tetrapropenyl group (CAS # 26544-38-7), while the other anhydride contains a predominantly linear dodecenyl side group (CAS # 25377-73-5). The third member of the category is the hydrolysis product of tetrapropenyl succinic anhydride, tetrapropenyl butanedioic acid (CAS # 27859-58-1).

**(2) Polybutylene succinic anhydrides**

The category covers two substances, each containing mixed monoalkyl succinic anhydrides. The alkyl portion of these anhydrides is either a polyisobutylene (CAS # 67762-77-0) or a polybutenyl (CAS # 67762-79-2) group of varying lengths (carbon number ranges not given) yielding molecular weight ranges of 500-2,500 for the anhydrides. These substances apparently contain the monoalkyl succinic anhydrides as the major constituent, with a residual amount of polybutenes present (content undefined). It is not clear

from the description given by the submitter whether the molecular weight distribution of the monoalkyl succinic anhydrides in the substances is similar for all the production batches or is skewed towards higher or lower molecular weights to meet the requirements for specific applications.

### **Category Justification**

#### **(1) Alkenyl succinic anhydride**

The submitter's justification for the category is based both on the functional similarity between the two monoalkyl succinic anhydrides and on the fact that the hydrolysis products of these anhydrides are important for determining the environmental and toxicological properties of the anhydrides. The submitter expects that the differences in the alkyl portions of the hydrolysis products of the two anhydrides will not significantly affect the environmental fate or toxicological properties of the hydrolysis products. This would permit the use of data on tetrapropenyl butanedioic acid to estimate values for those SIDS-level endpoints where the hydrolysis product of dodecenyl succinic anhydride is expected to determine test results. Considering the testing strategy, the dominance of the hydrolysis products in determining the environmental fate and toxicological properties of the anhydrides, the expected similarities in the physicochemical properties (e.g. water solubility and log K<sub>ow</sub>) of the succinic anhydride hydrolysis products and the high LD<sub>50</sub>'s for the acute mammalian oral toxicities for both of the monoalkyl succinic anhydrides, the proposed justification for the category appears reasonable, but depends on clarifying the hydrolysis properties of these chemicals.

#### **(2) Polybutylene succinic anhydrides**

The submitter's primary justification for the category is the structural similarity of the monoalkyl succinic anhydrides and the expectation of similar physicochemical, environmental and toxicological properties. From the estimated physicochemical data provided by the submitter, and the common structural features (e.g. succinic anhydrides containing branched alkyl substituents and with similar molecular weight distributions) of the category members, it is reasonable to expect that the environmental and ecotoxicological properties of these substances will also be similar. Available data for acute oral and dermal toxicities and *in vitro* mutagenesis assays also support the category. However, the proposal to bridge data on a non-category compound, tetrapropenyl butanedioic acid, to the repeated-dose and reproductive/developmental toxicities of the two category members may not be appropriate because of differences in molecular weight and physicochemical properties of the dioic acid compared to the category members. The submitter needs to demonstrate that these differences will not result in differences in the toxicological properties of tetrapropenyl butanedioic acid and the category members.

### **Test Plan**

*Environmental fate–Hydrolysis.* In both submissions the submitter states that for hydrolysis the public and private literature will be evaluated to determine whether there is sufficient information to adequately characterize this endpoint. If adequate information is not available, hydrolysis testing will be done. Given that the rate of hydrolysis of the chemicals and the nature of the hydrolysis products are key components of both test plans, the literature search, at a minimum, should have been conducted before the test plans were submitted. Also, the range in molecular weight of the polybutylene succinic anhydrides category may affect the rate of hydrolysis and hence possibly environmental and health effects.

#### **Polybutylene succinic anhydrides**

As the size of the hydrocarbon side chain increases it is expected that the compounds will have higher melting points, higher boiling points, lower vapor pressures and lower water solubility. Accordingly it might be wise to test a representative low molecular weight compound and a high molecular weight compound

for the category. Tests on the lower molecular compound would likely be more important because of its greater volatility and greater water solubility.

*Health effects.*

(1) Alkenyl succinic anhydride

No data exist for the following endpoints:

- Acute fish and aquatic invertebrate toxicity
- Genotoxicity
- Repeated-dose toxicity
- Reproductive/Developmental toxicity

The submitter proposes testing for all the above endpoints using the category member tetrapropenylbutanedioic acid (the hydrolysis product of category member, tetrapropenylsuccinic anhydride). If the sponsor chooses to limit testing to the acid, a discussion is needed to assess whether or not potential contact effects of tetrapropenylsuccinic anhydride or dodecenylsuccinic anhydride may produce a severity or range of toxic effects different from those that result from exposure to tetrapropenylbutanedioic acid. In addition, the sponsor should provide data on the rate of hydrolysis of tetrapropenylsuccinic anhydride to tetrapropenylbutanedioic acid (see *Environmental fate*).

(2) Polybutylene succinic anhydrides

No data exist for the following endpoints:

- In vitro* chromosomal aberrations
- Repeated-dose toxicity
- Reproductive/Developmental toxicity

A “technical discussion document is proposed to address” repeated-dose and reproductive/developmental toxicity “of members of the category based on read-across from test results of the structurally similar, tetrapropenyl butanedioic acid (CAS # 27859-58-1)” (test plan, p.iii). These data would be from the alkenyl succinic anhydride category (tetrapropenyl butanedioic acid is the hydrolysis product of the category member, tetrapropenylsuccinic anhydride). This is questionable because:

(1) This acid is not the hydrolysis product of either of the polybutylene succinic anhydrides, although it is structurally similar to the expected hydrolysis products of the polybutylene succinic anhydrides; in both cases the hydrolysis product is a butanedioic acid, but with different side chains.

(2) No data were provided on the rate of hydrolysis of the polybutylene succinic anhydrides to the corresponding acids.

The submitter proposes testing for *in vitro* chromosomal aberrations using one of the category members (polyisobutylene succinic anhydride). Given that the submitter proposes to use the test results from tetrapropenyl butanedioic acid to address the repeated-dose and reproductive/developmental endpoints for this category, the submitter needs to explain why it would not use tetrapropenyl butanedioic acid for this test instead of using polyisobutylene succinic anhydride, provided the above concerns (1-2 above) are addressed.

*Ecotoxicity.* In the test plan for alkenyl succinic anhydride the reported EC50 for algae is 93 mg/L, whereas for polybutylene succinic anhydrides the reported toxicity values for fish, aquatic invertebrates, and algae are greater than 1,000 mg/L. These values are presumably based on the toxicity of the hydrolysis products which the submitter believes should be similar. If tetrapropenyl butanedioic acid is to

serve as a representative hydrolysis product for both submissions, then this significant difference needs to be addressed.

**Followup Activity**

EPA requests that the submitter advise the Agency within 90 days of any modifications to its submissions.